"For the T&E Professional"

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MAJOR RANGE AND TEST FACILITY BASE

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Dr. Jacques S. Gansler Appointed as the new Under Secretary of Defense for Acquisition and Technology

On November 10, 1997, **Dr. Jacques S. Gansler** was sworn-in as the new Under Secretary of Defense for Acquisition and Technology (USD(A&T)). Dr. Gansler succeeds **Dr. Paul Kaminski**..

Dr. Gansler is a former Executive Vice President and Director of TASC, an applied information technology company. Dr. Gansler has previously held positions in government and industry: Deputy Assistant Secretary of Defense (Materiel Acquisition); Assistant Director of Defense Research and Engineering (Electronics); Vice President, I.T.T.; Program Management, Singer Corporation; and Engineering Management, Raytheon Corporation. Before his appointment Dr. Gansler also served as the Vice Chair of the Defense Science Board.

Dr. Gansler's career has also contained several academic appointments including: 'Visiting Scholar,' Kennedy School of Government, Harvard University; Honorary Professor, Industrial College of the Armed Forces; and 'Visiting Professor,' University of Virginia. Dr. Gansler has also spoken frequently as a guest lecturer on government management, and research and development at numerous US and foreign universities.

Dr. Gansler's academic credentials include a Bachelor of Electrical Engineering, Yale University; Master of Science in Electrical Engineering, Northeastern University; Master of Arts, New School for Social Research (Political Economy); and Doctor of Philosophy, American University (Economics).

Naval Air Warfare Center Trenton Soon to Close but Propulsion Research, Development, Test and Evaluation Capabilities will be Preserved

In 1991 and 1993, Base Realignment and Closure (BRAC) Commission decisions had a major impact on the future of the Naval Air Warfare Center Aircraft Division Trenton (NAWCADTRN). As a result of these decisions, NAWCADTRN is transferring functions, test facilities, programs, and certain civilian and military officer billets to two other government activities, and will completely close in 1998. These two activities are the Arnold Engineering Development Center (AEDC) and the Naval Air Warfare Center Aircraft Division Patuxent River (NAWCADPAX). Operational closure of the Trenton site is currently scheduled for December 15, 1998.

The NAWCADTRN has been a vital contributor to the development of US Navy aircraft propulsion systems for over 40 years. It was the Navy's only full spectrum research, development, test, and evaluation (RDT&E) activity specializing in aircraft propulsion systems.

Located on 66 acres in West Trenton, NJ, this facility is a Government-owned and Government-operated ground testing complex that had unique characteristics. It was the only facility in the nation having a capability at one site to test turbojet/turbofan, turboprop/turboshaft engines, piston engines, helicopter transmissions, fuels and lubricants, accessories, and propellers at sea level, virtually all altitudes, and environmental conditions.

When all the activities resulting from the BRAC decisions are finally completed, the Navy will continue to have both the facilities and personnel needed to effectively support the ***(Continued on Page 6)***

In This Issue

Director's Corner

Mr. John Gehrig

I'm devoting this quarter's column to acquaint you with two activities that, while not a part of the Major Range and Test Facilities Base (MRTFB), nevertheless are now managed through the DTSE&E Resources and Ranges (RR) office and provides critical support in the areas of Tri-Service authenticated data, methods and tools for use by the Services, CINCs and OSD. I'm referring to the Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) and the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME).

The JTCG/AS was chartered by the Joint Aeronautical Commanders Group in 1972 to address primarily aircraft vulnerability design issues and continues as a leader in providing aircraft vulnerability design information with methodology development employing Tri-Service approved modeling and simulations, as well as empirical design data on the effects of ballistic damage to aircraft structures (including advanced composite phenomenology).

The JTCG/AS also promotes aircraft survivability as a Service and industry design discipline and provides survivability improvement data and inputs to Service aircraft and aviation system program managers. As you can see, this organization influences requirements studies, procurement planning, performance assessments, and air vehicle survivability technology R&D investment and coordination.

Current initiatives of the JTCG/AS include: Integrated Survivability Assessment (ISA), a standard methodology for design, development, test and evaluation, to include all aspects of survivability, facilitating evaluation of an air vehicle's ability to survive in an integrated air defense system environment. The Joint Accreditation Support Activity (JASA) leverages the modeling and simulation verification, validation and accreditation support infrastructure and technical expertise developed under the Susceptibility Model Assessment and Range Test (SMART) Project which directly improves the confidence that can be placed in numerous models and simulations that support acquisition and helps air weapons systems program managers define and meet requirements at reduced cost.

Continuing JTCG/AS customers include the Joint Strike Fighter (JSF) program, the Suite of Integrated Infrared Counter Measures program, F/A-18E/F, the Ballistic Missile Defense Organization and Tomahawk. The Joint Technical Coordinating Group on Aircraft Survivability is also addressing technology development and test for hydrodynamic ram damage, fire suppression/reduction and Halon replacement. For further information on the JTCG/AS, you can view their web site on TecNet at http://tecnet0.jcte.jcs.mil:9000/jtcg/.

Joint Logistics Commanders chartered the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME), in December 1968, to improve Tri-Service databases and analytic munitions effectiveness methodologies employed in the Joint Munitions Effectiveness Manuals (JMEMs).

The mission of the JTCG/ME is to provide the mechanism for interservice efforts to improve the database and analytical methodology used in the determination of non-nuclear effects. This mission is accomplished through preparation and publishing of joint Service-authenticated JMEMs; development, maintenance and update of weapon effectiveness characteristics, delivery accuracy, reliability and vulnerability databases.

The JTCG/ME, additionally, has an important function in early design development and serves as a major test data supplier to support the development of improved Tri-Service methodologies employed in the design of current and future military equipment. This organization also affects requirements studies, procurement planning, performance assessments, mission planning, weaponeering and battle damage assessments.

Current JTCG/ME initiatives include: development of Advanced Joint Effectiveness Model (AJEM) for computing anti air effectiveness/lethality and target vulnerability; development of air-to-air CD-ROMs containing weapons characteristics, effectiveness data and computational methods for generating performance estimates; standardization of anti-air models and simulations, specifically the standard models and simulations to be used for joint studies of Theater Missile Defense; compliance with OSD's directives and regulations with respect to modeling and simulation, verification, validation and accreditation and JMASS compatibility; development of Joint Munitions Effectiveness Manuals for armor, artillery, infantry and Navy anti-ship systems (World Artillery & Mortar Systems--WAMS) (World Infantry & Tank Systems--WITS). For more information on the JTCG/ME, you can view their web site at http://amsaa-www.arl.mil/jtcg/.

Around the Staff

Lieutenant Colonel Raymond Cox, USAF, has transferred from Systems Engineering to the Office of Resources and Ranges. Before his assignment to the Office of the Director for Test, Systems Engineering and Evaluation, LTC Cox was a Project Manager with the Office of the Ballistic Missile Defense Organization.

Major Bill Reed, USAF, from the Headquarters, United States Air Force Staff is the newest RTA assigned to the Resources and Ranges Office. Major Reed will be working for **Mr. Irv Boyles** and will be focusing on modeling and simulation and corporate information management.

Mr. Eddie Greer, a former RTA from the Naval Air Warfare Center - Aircraft Division (NAWC-AD), Patuxent River, MD, has been promoted to GS-15. Eddie is now the Deputy Program Manager for the Airborne Strategic Communications Aircraft (E-6A/B). Congratulations to Eddie on his promotion and new position.

Training on Digital Battlefield marks milestone at Aberdeen Test Center

It's safer. It's faster. It saves money. It protects the environment. And, it makes the Army better. Now, it's proven to work, after recent testing at the Aberdeen Test Center (ATC). "It" is the Mobile Close Combat Tactical Trainer (CCTT). The "Mobile CCTT" simulates the M1A1 Abrams Tank and the M2A2 Bradley's automotive and weapon systems while realistically recreating opposing forces and allowing soldiers to react to test scenarios, all within trailers that can be moved anywhere in the world.

"CCTT is a training tool that saves time and money, it safeguards the environment and ensures troop safety while providing soldiers a realistic training experience," said **Mr. Jorge Alvarez**, ATC Test Director for the Close Combat Tactical Trainer. That realistic training was performed at ATC by more than 30 Texas Army National Guard soldiers from the 112th Armor Brigade and 141st Infantry Battalion in support of a pre-production qualification test (PPQT).

"The test and evaluation concept was to duplicate a series of realistic training exercises while providing data for developmental and operational assessments," he said. "The troops also benefited by fulfilling their monthly training requirement and obtaining a preview of the Army's newest training simulators."

According to ATC Commander **Colonel Richard O. Bailer**, the Mobile CCTT operational and developmental testing combined with National Guard training is an example of simulation enhancing live training. "Combining technical and operational tests is crucial to ATC's success in the coming years," he said. "Developmental and operational testers must become full partners in today's development and acquisition team, which includes combat and materiel developers, the manufacturing contractor and the operational tester."

The Mobile CCTT, fixed and mobile sites, are under development by the Simulation Training and Instrumentation Command in Orlando, FL. The mobile units are a scaled-down version of the fixed sites that can be transported anywhere. "The mobile version of the CCTT consists of a group of networked simulators, workstations and power generation equipment housed in two sets of trailers," Mr. Alvarez said.

The M1A1 Abrams Tank simulators, generator and the operations center occupy four trailers; the M2A2 Bradley Fighting Vehicle has a similar arrangement with an additional trailer for dismounted infantry workstations. He said the Mobile CCTT manned modules duplicate the M1A1 Abrams and M2A2 Bradley's automotive and weapon system to simulate realistic tactical training. Each trailer set has command, control and communications workstations that emulate combat support and service support elements. The workstations also can replicate semi-automated opposing forces and blue forces which realistically portray correct doctrine to the soldiers training in the system.

Unlike the actual M1A1 Abrams and M2A2 Bradley, the CCTT operates in a purely virtual environment and can produce training scenarios instantly, nearly tripling the number of training exercises per day and minimizing fuel, maintenance and noise. "CCTT is a jump toward realistic tactical training by using a system composed of five major elements -- workstations, manned simulators, after action reviews, network and protocols, and terrain and vehicle performance databases," Alvarez said.

The system appeals to soldiers at all levels. **Sergeant Pedro Rodriguez** of the 49th Armor Division, Texas Army National Guard, said the simulated training exercises "are useful tools because they allow you to sharpen your skills. You can repeat them time and time again until you get it right."

Captain Jaime A. Olivo, also of the 49th, has been working with the Bradley for 10 years. "I've seen automation upgrades over the years, but I believe the CCTT is the ultimate in technology advancements. Not only is CCTT a realistic and useful tool, but you also can cross-train to better understand the roles of the other crew members," he said.

Commanders like the concept as well. They can introduce enemy vehicles, generate additional forces and create scenarios where tactical training is conducted in a realistic and challenging real time training environment. In the virtual world, soldiers respond to situations where speed, training and execution are key to survival.

According to Mr. Alvarez, CCTT is part of an entire program of training systems known as the Combined Arms Tactical Trainer that will provide access to a virtual environment where soldiers can practice their most demanding unit tasks. "Troops will have the ability to train combined arms operations in company, platoon and battalion training exercises in a virtual environment where computer generated armor, infantry, artillery, combat engineers and aviation assets are prevalent," he said. "Soldiers can train for tasks too difficult, dangerous or expensive to undertake in a live training exercise."

The Aberdeen Test Center supported the PPQT and training exercises by providing safety inspections, human factors engineering measurements, weight distribution and center of gravity, road shock and vibration, trailer performance, high and low temperatures, rain, and data collection throughout the test. ATC also produced training videotapes shown to the troops during the introductory briefings. The final phase of the PPQT involved Army National Guard training while ATC collected developmental and operational data relating to hardware, software and soldier-machine interface. The Army's Operational Test and Evaluation Command provided questionnaires relating to training effectiveness.

After the PPQT, the Mobile CCTT went on the road to National Guard soldiers in Fort McClellan, AL, Camp Beauregard, LA, and Fort Hood, TX, proving the system can transport the virtual training environment to the soldier. The combination of developmental and operational testing and training, all in a virtual environment, made the process unique.

"The National Guard troop training exercises verified system performance in a more realistic manner than utilizing experienced contractors to perform the tasks," Mr. Alvarez said.

With fixed sites for school and unit training and mobile and relocatable configurations, the CCTT can reach National Guard units and is deployable overseas. CCTT will enable nearly every American soldier to train within a state-of-the-art integrated battlefield, CCTT is the future training system that will place American troops on the fast track by taking them far beyond the tactical combat training capabilities of potential adversaries. "As the soldiers are told during their introductory briefing, with CCTT, the world's best Army becomes even better," Mr. Alvarez said. "CCTT will change the way you train and see the world."

For more information about this article and the Aberdeen Test Center contact **Ms. Lena Goodman**, ATC Public Affairs Office, Aberdeen Proving Ground MD 21005-5059. Telephone (410) 278 - 4223 / Fax (410) 278-4046 [DSN 298].

Tropic Test Center Partners with Outside Scientific Organizations

A first-ever meeting between test specialists at the US Army Yuma Proving Ground-managed Tropic Test Center Panama and numerous scientists and researchers from Panamanian and United States research organizations took place last month in Panama City, Republic of Panama.

The workshop, entitled the "Gamboa Environmental Initiative / Tropic Virtual Proving Ground," was held to develop partnership relationships to explore research opportunities and examine the possibility of combining future research dollars. The result would be a firm partnership between Panamanian and US research and academic institutions to share tropic test data and facilities. Representatives from 20 different organizations, including representatives of five US national laboratories and seven organizations from the Republic of Panama, participated in the workshop.

"The results exceeded my wildest dreams," said **Mr. Graham Stullenbarger**, Chief of Yuma Proving Ground's Automotive and Natural Environment Test Division. "The pieces are coming together to accomplish what is a very complex scientific project, and Panamanian agencies and universities are fully participating as partners. As a matter of fact, the Panamanian contribution is critical."

The US Army has conducted an extensive tropic testing program in Panama since World War II, primarily in environmentally benign areas such as soldier systems, communications, and sensors. Since a pristine environment is required to realistically conduct this testing, Army officials are attempting to partner with Panamanian and United States organizations having the same interest. Planners hope for the mission to continue in Panama into the next century.

Gamboa Initiative workshop participants tour the Gamboa Test Area, a portion of the Tropic Test Center Panama, on July 29, 1997 (Photo by Mr. Chuck Wullenjohn).

"The result is a win-win situation for everyone," said **Mr. Lance VanderZyl**, Director of Yuma Proving Ground's Environmental Sciences Directorate. "At this workshop we saw biologists sitting next to physicists, who were sitting next to soil scientists, who were sitting next to university officials. Everyone shared a common interest in scientifically characterizing tropical conditions, such as in the thick jungle of Tropic Test Center's 2500 acre Gamboa Test Area. Resulting data would be shared throughout the international scientific community."

Fully characterizing the complex tropic environment is a massive undertaking which will lead to a thorough understanding of how tropic conditions affect newly developed military equipment and provide lab repeatability for scientists. Characterizing the environment will include studying and inputting data on variables such as terrain details, soil conditions, vegetation, climate, electrical data (jungle areas can be extremely conductive), hydrology, and much more.

The tropic environment is infinitely more complicated than other geographic areas, such as cold region or desert environments, explained Mr. VanderZyl. Multiple disciplines are required to fully characterize its many aspects.

Mr. Juan Hernandez, research analyst from the University of Panama, was one of the numerous participants in the workshop. He had high praise for the effort. “This was an eye-opener to many of the participants,” he said. “Because of the many complementary fields represented, we were able to see things from many angles – not just one. Two-way cooperation in future activities could very well result.”

In addition to the primary objective of the workshop, several independent relationships are developing between Panamanian and US research institutions and universities. According to Mr. Stullenbarger, a second workshop will take place early next year to evaluate progress. In the meantime, data will be gathered and newly established relationships strengthened.

Tropic Test Center operations are managed by Yuma Proving Ground personnel, with Mr. Graham Stullenbarger acting as director. He has spent many recent weeks working closely with Mr. Lance VanderZyl to organize the workshop and invite the participation of persons from numerous research organizations throughout the United States and Panama. The Tropic Test Center work force consists of three government employees and 26 contractors.

Members of the Gamboa Environmental Initiative / Tropic Virtual Proving Ground workshop get a taste of tropical conditions at the Yuma Proving Ground-managed Tropic Test Center at Fort Clayton, Republic of Panama. (Photo by Mr. Chuck Wullenjohn)

For more information about this article, the Tropic Test Center, and Yuma Proving Ground contact **Mr. Chuck Wullenjohn**, Chief, Public Affairs Office, Yuma Proving Ground, AZ 85365. Telephone: (520) 328-6189 / Fax (520) 328-6039 [DSN 899]. E-mail: cwullenj@yuma-emh1.army.mil.

IS CIM DEAD?
NO! - MORE ROBUST

What began as the Corporate Information Management (CIM) program has metamorphosed through the Business Process Re-engineering/Information Management (BPR/IM) program to what is now in compliance with the Information Technology Management Reform Act. In other words, what began as the Department of Defense (DoD) Corporate Information Management program is now mandated by Congress on all Executive Branch agencies, and the thrusts are broader.

Back in the late 80's, the Defense Science Board recommended to the Secretary of Defense that DoD needed to consolidate all the numerous stove-piped computer systems which had been developed. As a result of this recommendation the initiative called CIM was started. CIM included a very healthy budget and a sizable pool of personnel slots. Numerous activities were started under CIM, such as: identifying migration and legacy systems; BPR; data standards; and development of standard communication and computer architectures.

Although it has been over seven years since CIM was initiated, and the term CIM is no longer in use, DoD is seeing numerous CIM efforts pay off. Hundreds of legacy systems have been identified for replacement. Migration and target systems which incorporate data standards, utilize established communication and computer architectures which make them interoperable are projected to replace those legacy systems.

The original concept of a Corporate Information Management program was not limited to information systems. However, the term became synonymous with the replacement/upgrading of information systems. Therefore, the term CIM was replaced with other terms, such as Enterprise Integration (EI), and Business Process Re-engineering/Information Management. Even though the term CIM is no longer in use within DoD, the original concepts of interoperability, and functional process improvement are still valid and mandated concepts which should be pursued as worthy goals throughout DoD.

As stated in the President’s Annual Report to Congress: “The Department recognizes that it must continually look for opportunities to reduce unnecessary duplication, reduce costs, and increase the efficiency and effectiveness of its laboratories and T&E infrastructure.” Obviously this means there is continuous pressure to do the job “faster, smarter and cheaper.” Concepts such as Business Process Re-engineering, Data Standardization, conforming to Open Systems standards (e.g. High Level Architecture) in conjunction with the Joint Technical Architecture, the Defense Information Infrastructure Master Plan (DII/MP), and the DoD Modeling and Simulation Master Plan are all tools and activities which are available to assist test and evaluation to operate better. These tools and concepts are an outgrowth of the CIM initiatives and should be utilized by individuals and organizations to make improvements towards accomplishing and being consistent with the DoD Joint Vision 2010.

Examining all the steps of a process and eliminating redundant and non-value added functions is the basic benefit of BPR. Being able to share information and using other peoples work, instead of "re-inventing the wheel" are both benefits derived from data standardization and using common computer and communication architectures. Unfortunately, the sizable central CIM budget is history. As planned, the CIM infrastructure is now in place and funding of BPR efforts is the responsibility of the Services and Defense Agencies. The tools and concepts are available in DoD for everyone to use.

For more information about this article and the Business Process Re-engineering/Information Management Program contact **Mr. Dave Cathcart**. Telephone (703) 578-6157 / Fax (703) 578-0527. E-mail: CathcaDW@acq.osd.mil.

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RDT&E of air-breathing propulsion systems and their components, accessories, fuels and lubricants throughout all phases of the aircraft propulsion system life cycle.

NAWCADTRN Testing Complex

The history book on this facility begins in the early 1940s. World War II was still in progress when Navy officials recognized the potential of large gas turbine engines as powerplants for future Navy aircraft. It was also realized that these engines would require testing on the ground under repeatable and controlled, environmental and flight conditions before installation in an aircraft to minimize the risk and cost of flight testing.

Existing Navy reciprocating engine test facilities at the Aeronautical Engine Lab (AEL) in Philadelphia, PA were deemed inadequate for these anticipated powerplants. At that time, there were no facilities at any of the engine manufacturers for environmentally testing gas turbine engines.

A decision was made within the Navy Bureau of Aeronautics in 1944 to build such a facility at Trenton, NJ. This facility was commissioned as the Naval Air Turbine Test Station (NATTS) in July 1951 and was officially activated in 1955. Full scale engine testing started in 1956. At that time the facility had 3 operational large sea level test cells (1W, 2W, 3W) and 2 large altitude chambers (1E, 2E). Another large altitude chamber (3E) became operational several years later.

In the mid-sixties, the Navy decided to consolidate aircraft engine test facilities and a physical merger of AEL and NATTS started in 1971. The full capabilities of AEL were relocated to the Trenton facility. These capabilities included an engine rotor containment evaluation facility; testing facilities for small gas turbine engines, auxiliary power units, engine starters, propellers, gearboxes, transmissions; and fuel and lubricant analysis laboratories.

Upon completion of the consolidation in 1975, NATTS was renamed the Naval Air Propulsion Test Center. This name was subsequently changed to the Naval Air Propulsion Center (NAPC) to better reflect the mission of the Center which went well beyond just the test and evaluation of engines.

NAPC improved testing capabilities during the 1970s and 1980s by installation of gyroscopic, multi-purpose (rotatable), and variable attitude test stands at the Outdoor Test Site in nearby Lakehurst, NJ. Involvement with many other aspects of the aircraft engine propulsion business also began during this time frame. Included among these activities were programs for unmanned air vehicle powerplants, management of the Navy's exploratory and advanced development propulsion programs, updating and tailoring of propulsion system specifications, reliability and maintainability analysis for engines and components and development of accelerated engine duty cycles from aircraft mission profile and mission mix definitions.

In April 1991, the Secretary of the Navy approved a plan to consolidate Navy RDT&E, engineering, and fleet support activities. Under this plan, four warfare centers and one laboratory were formed. On January 1, 1992, the Naval Air Warfare Center Aircraft Division (NAWCAD) was officially established and NAPC became NAWCAD Trenton.

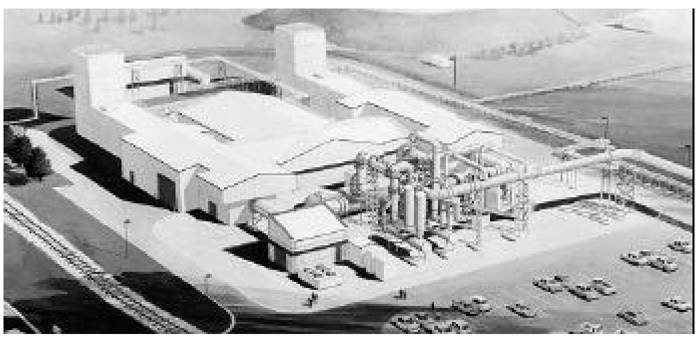
Another significant event occurred in 1991 when the BRAC commission recommended cessation of high altitude, large engine testing at NAWCADTRN and the transfer of that function to AEDC. Existing altitude test facilities at AEDC would be used for the Navy workload. In addition, scientists and engineers associated with propulsion RDT&E were to be transferred to NAWCADPAX. The result of these BRAC decisions was the eventual staged closing of Trenton's three large engine altitude test cells (1E, 2E, 3E) and the transfer of 157 civilian positions to NAWCADPAX in 1994.

The 1993 BRAC commission completed the actions begun in 1991 and recommended closure of NAWCADTRN. RDT&E personnel, equipment, test support functions, and propulsion testing facilities remaining at Trenton after the 1991 realignment were to be relocated to AEDC and NAWCADPAX. A total of 124 civilian and 2 military billets were slated to be transferred to NAWCADPAX. These civilian billets were a mix of engineer, technician, mechanic and craft positions. (The military billets transferred in 1994. Civilian billets are transferring in 1997 and

1998.) In addition, 12 civilian and 2 military billets were to be transferred to AEDC.

As a consequence of the 1993 BRAC decisions, small engine altitude test workload and large engine sea level environmental testing will be transferred to AEDC. Two small engine altitude chambers (4W, 5W) were shipped from Trenton to building 878 at AEDC and redesignated as T12 and T11. These chambers are used for testing of small turboprop engines, small turboshaft engines used in helicopters, and also engines used in cruise missiles. Sea level and altitude testing, steady-state and transient testing, start testing at extreme temperatures and corrosion testing can be performed in these test cells. Chamber T11 became operational in August 1997 and T12 is expected to be operational in the Spring of 1998.

Navy large engine sea level environmental test programs are conducted in test cells 1W and 2W at Trenton. Since they are part of the NAWCADTRN infrastructure and cannot be moved, a new facility had to be constructed at AEDC. This facility is called the Navy Large Engine Environmental Test Facility and consists of two chambers, designated SL2 and SL3, that will replicate the capabilities of 1W and 2W. Initial operating capability is scheduled for September 1998. The types of tests that can be performed in this facility include accelerated simulated mission endurance tests, icing tests, corrosion tests, sand and water ingestion tests, and extreme temperature start tests.



Navy Large Engine Environmental Test Facility at AEDC

The closure of Trenton entails the transfer of significant testing capabilities to NAWCADPAX. A new building was needed to house the testing capabilities being relocated. Construction of this building, which is designated the Propulsion Systems Evaluation Facility (PSEF), is nearing completion. Starting in February 1998, the following test facilities and support systems are scheduled for transfer to NAWCADPAX:

- Accessory Test Area
- Rotor Spin Facility
- Helicopter Transmission Test Facility
- UAV Test Cell
- Fuel System Component Test Area
- Fuels and Lubricants Test Area
- Fuels and Lubricants Analytical Laboratory
- Infrared Laboratory and Test Facility
- Information Systems Development Laboratory
- Central Computer Facility
- Test Support Systems
- Office Support Systems
- High-Volume Fuel Flow Facility

Most of these facilities are scheduled to be operational by the Fall of 1998.

Propulsion Systems Evaluation Facility at NAWCADPAX

The Accessory Test Area (ATA) is composed of eight test rooms, associated control room, and support facilities. They are used for the complete testing of engine starting systems, auxiliary power units, ram air turbines, generators, pumps, and air-breathing engine components independent of the engine itself. A compressed air system serves three test rooms and there are power absorption units in two of the test rooms. In addition, one unique test cell is dedicated to lubricant qualification testing and uses the T63 engine as a test vehicle to qualify engine lubricating oils.

The Rotor Spin Facility (RSF) at NAWCADTRN is one of the largest in the country. The RSF is used to experimentally develop and evaluate the structural and material aspects of gas turbine engine rotor design. Simulated engine conditions are used to investigate rotor stress distribution, low cycle fatigue, crack growth, burst characterization, and containment studies. With five above-ground vacuum test chambers, the RSF can test small to large rotor disks and accessories (up to 8 feet in diameter) at spin speeds up to 150,000 revolutions per minute. A special high-speed camera system is stationed in Chamber No. 1 to provide detailed pictorials of the test article for record and study purposes. Engineers evaluate new exploratory and advanced development concepts, as well as demonstrate component life predictions and overspeed capability for engines in life cycle phases of flight release, production release and fleet service.

Total helicopter power drive systems (excluding the rotor and hub) are capable of being tested under simulated flight loads in the Helicopter Transmission Test Facility. Loads are imposed by a 8,100 horsepower Philly Gearbox and power is provided by two gas turbine engines. The horsepower capability of the gearbox enables the drive systems of current helicopters to be tested over all power ranges. A central control room supports instrumentation, measuring, recording and test control devices. Component efficiencies, vibrations and other transient data can be recorded. Additional capabilities include the performance evaluation of components such as disconnect couplings, oil coolers, tail drive gearboxes and alternate fuels and/or lubricants.

The UAV chamber is a pressure vessel for testing small reciprocating and turbine engines while simulating pressures from sea level (14.7 pounds per-square-inch absolute (psia)) to

19,000 feet (7.0 psia). This self-contained chamber is capable of exhausting air at 44 pounds/second (sea level) and 21 pounds/second (19,000 feet). The chamber size is approximately 8 feet in diameter by 15 feet long.

Fuel system hardware and components, such as controllers, pumps, and ground and aerial refueling hardware are tested in the Fuel System Component Test Area (FCT). It also includes a F404 engine gearbox installation with mounted accessories. The FCT contains an environmental chamber to simulate environmental conditions and an “air room” to simulate compressor discharge pressures up to 500 pounds per-square-inch gauge. The facility is also capable of structural testing of the aerial and ground refueling components. A central control room supports instrumentation, recording, measuring and test control devices.

The Fuels and Lubricants Area consists of 15 separate test/control rooms. The test rooms are used to assess the deposition characteristics of gas turbine engine lubricants in the liquid and vapor phases. Load-carrying capacity and thermal stability tests are conducted for engine gearbox lubricants. Fuel lubricity and system icing inhibitor tests are conducted to gather quantitative and qualitative data on fuel and lubricants. In addition, the area includes the capability to conduct performance and qualification testing for all naval aviation fuel filtration requirements.

The Fuels and Lubricants Analytical Laboratory is used to completely determine all physical and chemical specification properties for naval aviation fuels and lubricants. It is composed of four main rooms. The chemical analysis area contains advanced chemical analysis instruments, such as a spectrometer, chromatograph and scanning calorimeter. Instruments for conducting standardized fuel and lubricant tests in order to resolve Fleet problems are contained in the property testing area. The balance area contains a wide variety of electronic balances and optical microscopes. The data base and records room contains the laboratory information management system for all work in the facility. This facility is the sole naval aviation lubricant qualification site.

A mobile instrumentation van and an associated calibration laboratory constitute the major components of the Infrared Laboratory and Test Facility. The van is fully self-contained and is used to acquire infrared emission data on aircraft and gas turbine engines. Specialized equipment used in the van includes spectral radiometers, a thermal imaging system and a data acquisition system with a minicomputer. Additional systems include a tracking pedestal, video and audio equipment, and ranging wand weather systems. The calibration laboratory contains equipment to support the calibration of the IR systems and provides a storage area.

The Information Systems Development Laboratory prepares VME-based computer systems, engine control systems, and data interfaces. Alarm, warning and display systems for engine control rooms are configured and tested prior to engine testing. Specialized in-house systems are also designed and tested.

The Test Support Systems consists of specialized test equipment storage areas, equipment, preparation areas and small shop support equipment and machines.

Office Support Systems consists of personal computers and software, and a limited amount of office furniture.

Ground fueling and aerial refueling components, such as nozzles, couplings, and valves are tested in the High-Volume Fuel Flow Facility (HVF) at simulated aircraft operating flow and pressure conditions. The HVF includes a 2,000-gallon fuel tank and two 100-horsepower engines, each driving a 600-gallons/minute pump. All the controls and instrumentation required to direct, indicate, and record the activities in the test area are also included within the facility. This is the only facility not transferring to the PSEF. Installation is scheduled at another site (building 2243) at NAWCADPAX.

The NAWCADTRN also has three additional facilities at an outdoor test site in Lakehurst, New Jersey (approximately 40 miles southeast of Trenton). Situated on this 21-acre site are the Gyroscopic Moment Test Facility, Variable Attitude Test Stand, and Multipurpose (rotatable) Test Stand. These facilities were not impacted by the BRAC decisions and will remain in-place and operational.

Since the time of the 1991 and 1993 BRAC decisions to the present, tremendous effort has been, and will continue to be spent, to phase-out the facility workload, and to ensure the smooth transition of people, test facilities and capabilities to AEDC and NAWCADPAX. Significant effort has also been expended to assist those employees who were not offered a transfer of function or opted not to relocate. Staffing levels are now down to approximately 200 personnel, which is a substantial reduction from the level of 740 in 1992.

Although NAWCADTRN will be closed in 1998 due to the BRAC decisions, its proud heritage will live on. Naval Aviation will continue to receive superior propulsion support as a result of the relationship and cooperation established with the Air Force at AEDC and the dedication of its propulsion engineers and test support staff at NAWCADPAX.

For more information about this article, contact **Mr. James F. Thaler**, Executive Director, NAWCADTRN at (609) 538-6652.

AEDC Baking Soda Blaster Exceeds Cost Avoidance Estimates

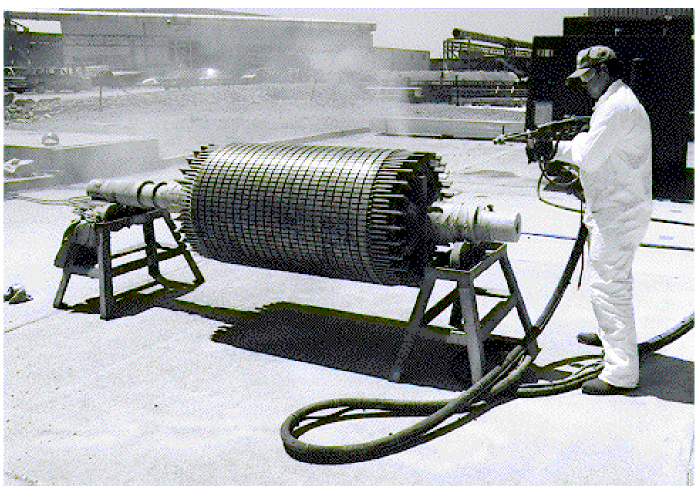
Using the Arnold Engineering Development Center’s newest cleaning tool, AEDC employees will help the center avoid nearly $114,000 in maintenance and hazardous waste disposal costs this year.

The baking soda blaster, purchased last year, saves both time and money by reducing the number of hours and employees needed to clean equipment and decreasing the amount of hazardous waste produced.

When AEDC’s maintenance team purchased the blaster, they originally estimated an annual $35,000 labor cost avoidance using this low-cost, environmentally and user-friendly process. However, during the past six months, crews have already avoided @28,000 in labor costs only. That total is expected to exceed $50,000 by the end of the fiscal year, according to Facility Operations and Maintenance Department's **Mr. Dave Roden**.

For a small job, the old four-step process using chemical baths and wire scrub brushes required two men working 80 hours incurring labor costs between $2,100 and $2,500 depending on the equipment being cleaned. Now, with the soda blaster, one man completed the two-week process in only four hours, costing only $128 dollars.

Instead of removing the equipment and manually dipping and scrubbing the components, crews remove dirt and corrosion by spraying the equipment with a mixture of baking soda and high-pressure cold water. This mixture dries into a paste residue that absorbs grease and oil buildup. When the residue dries, the team uses a high-pressure, cold water rinse to remove it. Since baking soda is an environmentally safe substance, only limited amounts of hazardous wastes are generated and additional costs are avoided.



Mr. Willie Bryant cleans a large compressor motor with AEDC's baking soda blaster. Using the environmentally friendly cleaning system will help AEDC avoid an estimated $114,000 by the end of the year in labor and disposal costs. (Photo by Mr. David Housch)

"Before we began using this method, we generated 14-20 drums of hazardous waster per month at an average disposal cost of $268 dollars each," Mr. Roden said. "Now, with the soda blaster, we only create about one drum per month, resulting in an additional estimated avoidance of $64, 320 per year." That brings the total estimated cost avoidance for fiscal year 1997 to nearly $114,000.

So far, maintenance crews have cleaned Engine Test Facility exhausters, Propulsion Wind Tunnel and Von Karmon Facility large rotor compressor assemblies and large electric motor components. They've even removed oil-stains from concrete floors without damaging the surface.

"This process is so gentle, it can remove nail polish without harming the cuticles on a person's hand, and it can remove graffiti from a car without damaging the clear coating," Mr. Roden said. "The use of the blaster has really become popular, and employees are beginning to use it as a daily tool."

The maintenance team is upgrading the system to provide cleaning capabilities in areas once off limits. A new high-profile detail blaster nozzle assembly allows high-detail cleaning of delicate parts like the insulation on high-voltage motors. Additional blast hoses increase the ability to reach remote locations such as the inlet airflow ducts that could not be accessed before because of the blaster's size.

In the near future, crews will use the blaster to remove rust build-up in the steel inlet airflow ducts as part of the center's Fighter Inlet Flow Upgrade (FIFU) Program.

"Recognizing this process as another potential tool for rust remediation, our program funded the pilot soda-blast effort," **Mr. Steve Dunn**, Project Manager for the FIFU program, said. "This process provides AEDC with an effective near-term method to remove accumulated rust scale. It's a good example of synergy between our investment projects and facility maintenance."

For more information about this article and AEDC contact **Ms. Tina Barton**, AEDC Public Affairs Office, AEDC, Arnold AFB, TN 37389-2213. Telephone (615) 454-5586 [DSN 340]. AEDC's Home Page on the World Wide Web is: http://www.arnold.af.mil.

Range Commanders Council 50th Executive Committee Meeting held at Arnold Engineering Development Center

The Arnold Engineering Development Center (AEDC) recently hosted representatives from 19 test and training ranges from throughout the Department of Defense (DoD) during a week-long meeting at AEDC's Gossick Leadership Center. The Range Commanders Council (RCC) used the Gossick Leadership Center as a setting for their non-bureaucratic approach to solving bureaucratic problems.

The RCC provides a forum for the resolution of problems common to the test, training, and operational ranges and conducts equipment, instrumentation, and software exchanges, transfers, and loans among its members that result in millions of dollars in cost avoidance savings annually.

The week-long meeting was divided into two serial meetings. The Executive Committee (EC), met the first two and a half days, culminating in a tour of AEDC's facilities and the celebration of the convening of the 50th meeting of the Range Commanders Council Executive Committee. The Executive Committee celebrated the occasion with a specially designed cake that featured the RCC logo and the words **50th Executive Committee Meeting** scrolled across it. In the latter part of the week, the range commanders arrived for their Range Commanders Council meeting.

Both groups participated in open-forum, round-table discussions. The council has a number of technical groups like modeling and simulation, range instrumentation, and environmental security. Each technical group is responsible for going out in between the meetings, which occur every six months, and gathering and resolving issues. They then report back at the Range Commanders Conference what progress has been made, what obstacles remain and where they need additional direction.

From Left to Right: Mr. John Rampy, AEDC Executive Director; Mr. Daniel Wenker, 30th Space Wing (outgoing EC Chair); and Mr. Rich Pace (ODTSE&E/RR) prepare to cut the cake commemorating the Range Commanders Council Executive Committee's 50th meeting. (Photo by Mr. David Housch)

The RCC, which was founded in August 1951, reorganized in 1969 and replaced its former Steering Committee with the present Executive Committee. The Executive Committee serves as the RCC's Board of Directors and as such oversees the activities of the 16 RCC standing and ad hoc groups on behalf of the Range Commanders. Currently, over 650 military and civilian personnel serve the various elements of the RCC.

For more information about this article and Arnold Engineering Development Center, contact **Mr. Steve Calatrello**, AEDC Public Affairs Office, Arnold AFB, TN 37389-2213. Telephone (615) 454-5586 [DSN 340]. The World Wide Web site for AEDC is: http://www.arnold.af.mil.

Department of Defense (DoD Threat Systems Program Ensures Credible Threat Representation to Support T&E and Training

The Threat Systems Program (TSP) is an initiative of the Office of the Director, Test, Systems Engineering and Evaluation (ODTSE&E) to ensure that accurate, cost effective representations of threat weapon systems are used to support test and training programs. The TSP provides integrated policy and oversight for threat representation efforts of the military Services and representative threat system related activities of the Defense Test and Training Steering Group (DTTSG), the Department of Defense Threat Systems Validation Review Committee (TSVRC), the Joint Targets Oversight Council (JTOC) and the CROSSBOW Committee (which coordinates Service and joint threat simulator efforts). A primary function of the TSP is to facilitate the coordination of test and evaluation requirements for threat representation and the DoD Intelligence Production Program (DoDIPP).

The Office of the Secretary of Defense (OSD) coordination of the development and acquisition of threat simulators can be documented from 1966 when the CROSSBOW-S (Construction of a Radar to Operationally Simulate Signals Believed to Originate Within the Soviet Union) Committee was established as the tri-Service focal point for Soviet Air Defense Weapon simulators. In 1983, CROSSBOW-S came under the supervision of an OSD established Joint Executive Committee on Air Defense Threat Simulators (EXCOM) which was chartered to determine priorities, preclude unwarranted duplication of effort, set clearance and classification levels, review threat requirements and provide general guidance to assure an integrated tri-Service program. Day to day coordination of OSD threat simulator activities was accomplished by the CROSSBOW Office, an OSD staff element co-located with the Missile and Space Intelligence Center at Redstone Arsenal, Alabama.

In June 1995, the DTTSG, in addition to other responsibilities, replaced the EXCOM. The DTTSG provides direction, policy, guidance, and program approval for all DoD development and acquisition programs for threat weapon systems hardware simulators, emitters, software simulations, and hybrid representations. The DTTSG maintained the CROSSBOW Committee as a permanent body to facilitate the working level activities necessary to support threat simulator responsibilities.

In April 1996, DTSE&E established the Threat Systems Office (formerly the CROSSBOW Office) as the DTSE&E staff proponent for all threat resources used to support T&E and training and directed the Threat Support Office to develop an integrated Threat Systems Program (TSP) that would provide a common basis for DTSE&E coordination and oversight of threat system activities responsibilities.

The TSP emphasizes joint planning and decentralized execution. By integrating DTSE&E coordination of all threat weapon and electronic warfare system support to T&E and training programs the TSP ensures the most effective use of resources and provides a central forum for comparing needs and identifying available assets. The primary areas of interest are DoD and Service threat simulator, target, foreign materiel and validation efforts.

- Within the OSD/DTTSG architecture, the CROSSBOW Committee is the technical arm and tri-Service focal point for review and coordination of all aspects of threat simulator development and acquisition supporting US weapon systems testing and combat crew training. In addition, CROSSBOW provides funding for technical investigations and workshops that examine critical foreign threat system technology issues.

• Threat target systems are managed as part of an overall DoD Project Reliance program focused on improvements within the DoD T&E infrastructure. The targets reliance effort is headed by the Joint Targets Oversight Council (JTOC) with support provided by the Targets Reliance Office (TRO). The Army, Navy, Air Force, and BMDO participate in efforts to share target resources and jointly manage target capabilities in response to target user needs. Target systems are acquired to provide threat representative presentations to weapon systems in live fire engagements for both T&E and training operational forces.

• Coordinated by the Defense Intelligence Agency (DIA) and OSD, the acquisition and exploitation of actual threat weapon systems remains a high priority for system developers and program managers. Successful testing against actual threats provides a high degree of confidence in the effectiveness of US systems. Used in combination with simulators and suitable surrogates, these actual threat systems provide a real-time open air, T&E capability for portraying air, naval, and ground based threats.

• The validation of representative threat systems, i.e. measuring and documenting the differences between the representation and the actual threat, is essential to the integrity of T&E and training programs. To ensure consistency in validation, the DTSE&E reviews and provides recommendations on Service validation reports concerned with threat systems (simulators, targets, and models and simulations) used to support major weapon system milestone decisions throughout the acquisition process.

In addition to active participation and coordination within the activities described above, the Threat Systems Office manages DTSE&E funding support for threat system related projects and activities. There is no other source of funding devoted to the equivalent of basic research to apply new technology for threat representation. Executed by the Services and DIA, these projects enable the Services to integrate new technology in threat representations and better respond to the needs of trainers and testers.

• OSD provides limited funding to projects that provide tools to facilitate development of threat representations and provide opportunities for the exchange of the latest scientific and technical estimates between the intelligence, T&E, and training communities.

• Other supported activities reflect efforts directed towards the prevention of technological surprise by investigating and demonstrating technologies expected in future threat systems and threat representations. These projects provide technology improvement for Service funded projects, identify smarter and better uses of simulations, and fund "piggy-back" projects to assist the Services in representing threats in testing and training.

• Target related projects are funded by OSD to resolve threat representation shortfalls. Target Management Initiative (TMI) recommendations from the JTOC are approved by the DTTSG, executed by the Services, and reviewed by the Targets Reliance Office. The Threat Systems Office provides the DTSE&E interface for management, oversight, and review of project execution.

In all of the above activities, the Threat Systems Office acts as the DoD bridge linking the intelligence, T&E and training communities in a partnership focused on proactive support to the user. In order to facilitate this coordination the Threat Systems Office is committed to providing a one stop source for threat system support information.

• The Automated Joint Threat Systems Handbook (AJTSH), updated in July 1997 provides a comprehensive listing of threat simulators, targets and foreign materiel assets available to support T&E and training.

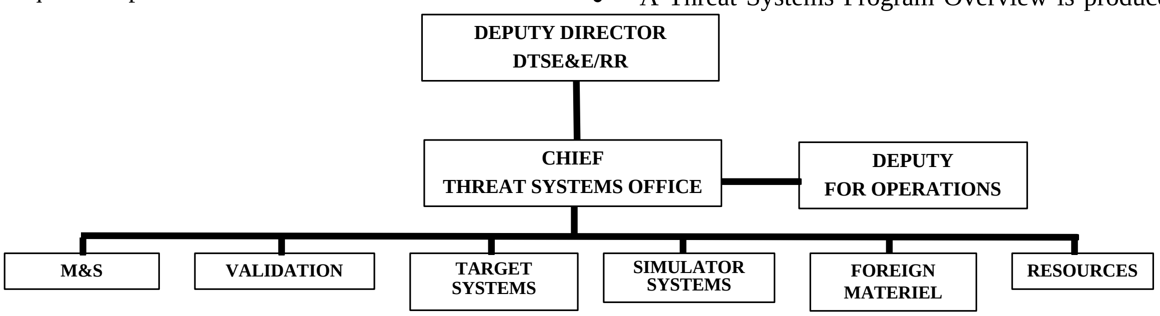
• The Threat Systems Program Plan (TSPP) is in the process of update and will provide a consolidated source for policy and procedural information as well as status of ongoing projects.

• A Threat Systems Program Overview is produced annually that serves to highlight Service program accomplishments as well as providing general information on recent activities.

• A review of Test and Evaluation Master Plans (TEMPs) is underway that along with continued coordination with Service threat system program managers will assist long range planning.

• The Threat Systems Office maintains a library of DoD approved validation reports and can assist in identifying Service validation sources.

For more information about this article and the TSO contact **Mr. John Smith** at (205) 955-8213, or FAX (205) 955-8211. The TSO also maintains a Web site located at http://ns.msic.dia.mil/tso/index.htm which can be accessed from the DTSE&E home page.

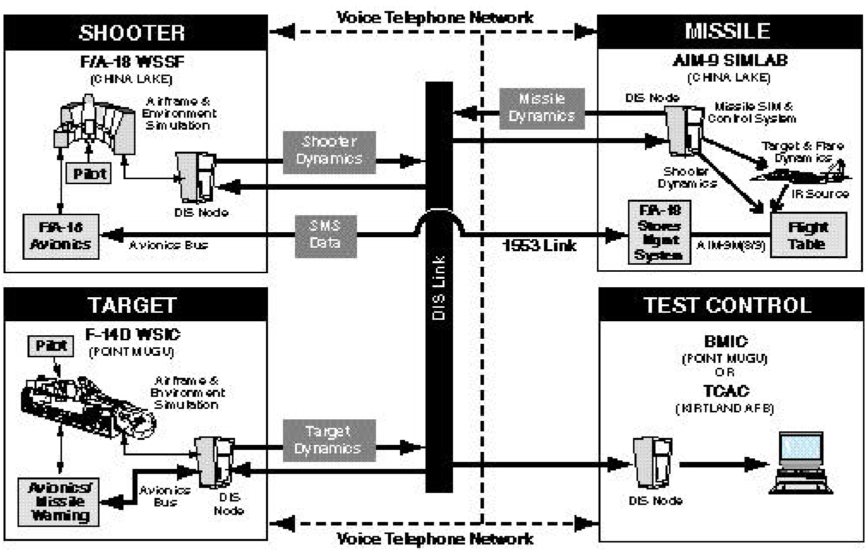


The DOD TSP is coordinated by the Threat Systems Office (TSO), an element of the Office of the Deputy Director for Resources and Ranges (RR) of the DTSE&E and is organized as shown above.

Joint Advanced Distributed Simulation (JADS) System Integration Test

The Joint Advanced Distributed Simulation (JADS) Project recently concluded a successful, first-of-it's-kind test involving four Naval Air Warfare Center - Weapons Division (NAWCWPNS) facilities. The test evaluated the ability of the JADS to complement and enhance techniques for testing powered, guided weapons used against maneuvering targets.

The JADS, which is sponsored by the Office of the Secretary of Defense, is managed by the Joint Test Force (JTF) located in Albuquerque, NM. The JADS is a Joint Test and Evaluation project and is part of the defense community's ever-expanding field of modeling and simulation (M&S). The growth of M&S is a result of downsized defense budgets, expanded computing capabilities and increased experience in the integration of multiple types of simulations with live operations. The JADS Project consists of three major tests: the Systems Integration Test (SIT); the End-to-End Test; and the Electronic Warfare Test.



The recent NAWCWPNS test was the Linked Simulator Phase (LSP) of the Systems Integration Test. A second phase, the Live Fly Phase, is being conducted at Eglin AFB, FL. The LSP applies JADS to an air-to-air missile test program and involves the simulation of an aircraft launching a missile against a maneuvering target aircraft. The JADS techniques were used to link aircraft software-integration laboratories to an air-to-air missile hardware-in-the-loop (HWIL) simulation laboratory that represented the missile. One of the unique characteristics of this scenario was that actual F-14 and F-18 pilots were brought into the test loop. This configuration allowed the reaction of the target-aircraft pilot and the aircraft's countermeasure systems to be evaluated without endangering the pilot. This capability is a key potential benefit of the JADS to test and evaluation.

In the LSP test, the launch aircraft was represented by the F/A-18 Weapon System Support Facility (WSSF) at China Lake, CA. The target aircraft was represented by the F-14D Weapon System Integration Center (WSIC) at Point Mugu, CA. The missile selected for the test was the Sidewinder AIM-9M-8/9, a supersonic, air-launched, guided missile employing passive infrared target detection. The missile was represented by the Missile HWIL Simulation Laboratory (SIMLAB) at China Lake, CA. The initial stages of the test were controlled from the Battle Management Interoperability Center (BMIC) at Point Mugu. The final stages were controlled from the Test Control and Analysis Center (TCAC) in Albuquerque, NM.

One of the objectives of the LSP is to evaluate the validity of missile data obtained through the JADS configuration. In the baseline scenario, based on AIM-9M-8/9 Joint Initial Operational Test and Evaluation live-fire testing, a QF-86 target drone began a 3.5-*g* maneuver and continued this constant rate turn throughout the engagement. The F/A-18C shooter launched the AIM-9M-8/9 missile at the QF-86 target drone. The target drone did ejected flares during the launching of the missile. This firing was one of several operational evaluation shots conducted on the China Lake Ranges.

This single - engagement geometry was used as the baseline for the entire LSP. The primary mission of the test was to replicate the live-fire launch parameters as closely as possible by having pilots in the F/A-18 WSSF aircraft and F-14D WSIC aircraft fly the same profiles as the live-fire aircraft. The missile data from the Simulation Laboratory were then compared with the live-fire data. The test was controlled by a test conductor in the BMIC/TCAC using the Distributive Interactive Simulation (DIS) display and a tailored display running on a personal computer that was driven by protocol data units (PDUs) sent from the F/A-18 WSSF.

The four facilities participating in the test were connected by the NAWCWPNS real-time network (NRNet), a point-to-point T1 (1.544 Mbps) network that uses advanced routing technology and in which each link is secured by National Security Agency approved cryptographic equipment. The DIS PDU's supported by user-defined protocol/internet protocol were used between each facility to exchange entity state information as well as the functional interactions "fire" and "detonate." New software was written for each facility to interface its system simulation with the DIS Network Interface Unit for communication over the NRNet. MIL-STD-1553 message traffic supported by transmission control protocol/internet protocol were transmitted via the NRNet from the F/A-18 WSSF to the Simulation Laboratory.

The Linked Simulation Phase was conducted from July to November 1996. During this time 169 engagements were "flown." Hundreds of additional Monte Carlo runs of various configurations were made to provide inputs to the JADS analysts. The results of the LSP will help to define the benefits of the JADS in the test and evaluation process and to establish simplified and effective JADS procedures for future exercises. NAWCWPNS has drafted a final report documenting lessons learned and recommendations to benefit the Department of Defense in future testing. The JADS JTF released a report in July 1997 detailing network performance and validation results.

For more information about this article and the JADS, contact **Ms. Eileen Shibley** at 760-939-2086 (DSN 437) or email: eileen_shibley@imdgw.chinalake.navy.mil.

7000th Shot Marks a Milestone in AEDC's G-Range

The Arnold Engineering Development Center's G-Range Test Team recently celebrated a milestone after making the facility's 7,000 shot. The shot occurred August 19, 1997, during a series of "kill effectiveness" tests sponsored by the Naval Surface Warfare Center (NSWC).

"These tests were to determine the effectiveness of the Navy Standard Missile-3 (NSM-3) in destroying the enemy target," **Mr. Randell Watts**, Sverdrup Project Manager, said. The NSM-3, a surface-to-air missile mounted on surface ships is used to intercept and destroy enemy missiles before they reach their target.

Since its first shot July 23, 1963, the G-Range Facility has undergone numerous changes in types of testing, test capabilities and staffing. The range was originally built as a free-flight aerodynamics test unit for evaluating various missile geometries. By the early 70s, the range workload had shifted primarily to weather erosion. From the mid-80s to the present, the primary requirement has been for impact lethality testing.

The G-Range test team after the first shot was fired July 23, 1963. Of the original team three members remain at AEDC; Ms Linda Welch, Mr. John Hill, and Mr. Jimmy Long. Mr. Hill and Mr. Long are also members of the present G-Range test team. (Photo by AEDC PAO)

According to facility engineers, the basic launcher has undergone four upgrades to date. It has evolved from a low-energy system capable of launching 2.5-inch diameter projectiles weighing 1 pound to a high-energy system capable of launching 8.0 inch diameter projectiles weighing up to 26 pounds at velocities up to 23,000 ft/sec.

Other facility improvements included the installation of the track and recovery system and state-of-the-art photographic systems. Added in 1977, the track and recovery system allowed projectiles to be rail-guided throughout the entire 1,000-foot instrumented range before being safely brought to rest a few hundred feet after entering the pressurized recovery tube.

Range instrumentation has increased steadily over the years from a small number of low-power X-rays and spark shadowgraphs to a vast array of pulsed-laser photography systems, schlieren, photopyrometers, radar's, ultra-high-speed framing cameras and data acquisition systems.

The facility has provided valuable data for various programs such as Apollo, Martin Sprint, Mark 12, Gallileo Probe and GAU-8. Involvement in the GAU-8 Program consisted of developing the ammunition for the A-10 aircraft's gun system used especially for killing tanks, hence the nickname "tank killers." In addition, the range has conducted numerous tests to provide ablation, heat transfer and wake observable data in support of various missile development and technology programs.

Of the original G-Range test team three members remain at AEDC. **Ms. Linda Welch**, **Mr. John Hill**, and **Mr. Jimmy Long**, were members of the original team when the first shot was fired. Mr. Hill and Mr. Long, an AEDC technician, were at the facility when the first shot was fired. Mr. Watt arrived at AEDC September 16, 1963, two months after the first shot and has stayed at G-Range throughout his AEDC career. Mr. Larry Campbell, an AEDC systems engineer, joined the team in April 1973, and is considered to be the G-Range historian by his co-workers.

The AEDC G-Range test team after firing the 7000th Shot August 19, 1997. (Photo by David Housch)

"We can only hope that the next 30 years will be as great as the past 30 years," Mr. Campbell said of the G-Range experience. Those years contain memories of the challenges they've encountered, some pleasant and some frustrating. Many memorable programs remain in the minds of the group, but most of them acknowledged the team's outstanding technical achievement as being the development of the counterfire test technique.

The counterfire technique demonstrated in 1994, entailed the collision of two projectiles (a larger "target" projectile and a smaller "impactor" projectile), launched with precise timing from opposing gun systems such that impact data was obtained at the combined velocity of the two launchers. Additionally, the technique permitted the recovery of the target projectile for post-shot data analysis.

"To obtain meaningful impact data at approximately 40,000 feet per second is an accomplishment unmatched anywhere," Mr. Watt said. "Our team' vision is to be the world's premier hypervelocity test facility…I think we are there."

For more information about this article and the G-Range Facility contact **Ms. Danette Duncan**, AEDC Public Affairs Office, Arnold AFB, TN 37389-2213. Telephone (615) 454-5586 [DSN 340].

The Gazette is published by the Director of Resources and Ranges. The Gazette is organized to contain letters, articles and stories from and about test facility and resource issues affecting DoD test activities identified in DoDD 3200.11, Major Range and Test Facility Base. The main purpose of the Gazette is to further open the lines of communication between and among field activities and OSD, and as such, it will be published frequently. Its contents will be information. The Gazette staff encourages inputs and feedback from all of you in the T&E community. If you have something to share with the Resources and Ranges Staff and/or Gazette readers, we welcome your views, experiences, or simply an opinion you would like to share with other T&E professionals about one of the many challenging issues we all face today. Please let us hear from you. To receive the Gazette, mail or call in your name, address, and office symbol. **You can write, call, fax or send material via: e-mail (Gehrigjf@acq.osd.mil); Telephone (703) 697-4813, [DSN 227-] / Fax (703) 614-9103 or Mail to, Director, Test, System Engineering and Evaluation, ATTN: Mr. John F. Gehrig, Room 3D1067, 3110 Defense Pentagon, Washington, DC 20301-3110.**